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10/642,544	08/15/2003	Hans-Ludwig Althaus	16274.150a	1984

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EXAMINER	
VAN ROY, TOD THOMAS	

ART UNIT	PAPER NUMBER
2828	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/642,544	Applicant(s) ALTHAUS ET AL.	
	Examiner Tod T. Van Roy	Art Unit 2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *26 July 2007*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-9,11-14,17,19-23,25,27-32 and 35-38* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-9,11-14,17,19-23,25,27-32 and 35-38* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

The examiner acknowledges the addition of claims 36-38.

Response to Arguments

Applicant's arguments filed 07/26/2007 have been fully considered but they are not persuasive.

With respect to claim 1, the Applicant has argued that Nagai does not teach the lens is easily removed, adjusted, or prevents back reflection.

The Examiner notes that the motivation used points out that these adjustments are made with respect to the presence of a waveguide. Zimmerman teaches an integrated lens and waveguide wherein if the lens needed adjustment or removal, the waveguide would be disturbed in the process. Nagai, on the other hand, teaches the lens to be separated from the waveguide, which would allow for easier adjustment and removal when viewed with respect to the waveguide not needing to be disturbed in turn.

The Examiner further notes that the tilted property of the lens of Nagai places the medium at Brewster's angle. This angle insures that p-polarized light cannot be reflected. As the p-polarized light cannot be reflected, back reflection is, at least in part, prevented from returning to the laser as outlined in the rejection. This would allow for transmission of light of a desired polarization when combined with Zimmerman, not adversely affecting the operation of Zimmerman's apparatus.

The Applicant has further argued that the lens of Nagai is taught to include a filter formed of dielectric film. The Examiner acknowledges that Nagai teaches this feature,

but notes that this portion was not motivated to be combined with Zimmerman. Nagai was only relied upon to teach characteristics of lenses coupled with waveguides, such as being separated and tilted. These teachings were then to be used by Zimmerman with the existing lens system. In conclusion, Nagai was not used to teach replacement of the lens of Zimmerman, but rather to use the characteristics of the optical coupling taught in Nagai in the system of Zimmerman.

With respect to claim 25, the Applicant has stated that the Examiner has not made clear the portions of the references noted in the obviousness rejection. For the Applicant's convenience the following passages are pointed out:

US 6714309 (col.4 lines 19-21)

US 6681133 (col.11-12 lines 67-2)

US 6526079 (col.1 lines 37-45)

US 6377592 (col.1 lines 11-25)

US 6349103 (col.1 lines 44-63)

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

The factual inquiries set forth in *Graham* **v.** *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 1, 2, 4-6, 8, 11-14, 17-22, 25-28, 30-31, and 35-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann (US 6580734) in view of Nagai et al. (US 5617435).

With respect to claim 1, Zimmermann teaches a laser module for optical transmission systems (fig.5) comprising a laser diode (fig.9 #83, col.7 lines-54-55) emitting light at an emitted output wavelength, an optical resonator connected to said laser diode (col.2 lines 21-24) and having a reflective mirror surface (col.2 line 22) and an adjustable effective optical path length (col.2-3 lines 66-2, fig.5 #86) and a photon density as a function of the effective optical path length (an inherent feature in the system since the laser diode is outputting an amount of light intensity into the cavity region), an optical waveguide having a Bragg grating receiving the light from the laser diode (fig.5 #98,96), and a stabilizer stabilizing the emitted output wavelength (col.4 lines 48-52), and a measurement apparatus for measuring the photon density within said resonator (fig.5 #91), an adjustment apparatus for adjusting the effective optical path length of said resonator (col.2-3 lines 66-2, fig.5 #86), and a control apparatus comparing the effective optical path lengths of said resonator and producing control

commands to said adjustment apparatus in order to adjust the effective optical path length of said resonator to equal the emitted output wavelength to a desired wavelength (col.8 lines 53-64), wherein said control apparatus is part of a control loop regulating the emitted output wavelength of the laser module at the desired wavelength, with the photon density being measured iteratively (col.8 lines 53-64, repetition of measurements recorded) and said control apparatus emitting a control command to said adjustment apparatus for adjusting the effective optical path length (col.8 lines 53-64, through feedback loop) of said resonator based on a slope measurement (col.11 lines 31-33), and coupling optics coupling said laser diode to said Bragg grating, said optics of an aspherical shape (fig.5 #94). Zimmermann does not teach the control command to be based on a difference between two successive measurements, the amount of adjustment of the effective optical length being proportional to the amount of difference between the two successive measurements, or the optics to be separated from the waveguide and tilted. Nagai teaches an external cavity laser utilizing lenses that are spatially separated from the waveguide (fig.4) and tilted. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a well known slope formula (Y2-Y1/X2-X1, based on successive measurements, adjustment then being proportional to the difference to the successive measurements; see MPEP 2144 - RATIONALE MAY BE IN A REFERENCE, OR REASONED FROM COMMON KNOWLEDGE IN THE ART, SCIENTIFIC PRINCIPLES, ART-RECOGNIZED EQUIVALENTS, OR LEGAL PRECEDENT – the basic rise over run slope calculation being common knowledge in the art) to simplify the control calculations using basic

arithmetic, and additionally, it would have been obvious to one of ordinary skill at the time of the invention to combine the laser module of Zimmermann with the separated lenses of Nagai in order to enable easier adjustment of the lenses with the diode, without moving the waveguide, as well as the ability to replace, or repair, an existing lens without the need to replace the waveguide, as well as to tilt the lens relative to the normal of the waveguide in order to obtain Brewster's angle, preventing back reflection to the laser diode (Nagai, col.9 lines 10-27).

With respect to claim 2, Zimmermann additionally teaches the reflective mirror surface of said optical resonator is highly reflective (col.2 lines 21-22, wherein it is inherent that the back facet of the laser diode is highly reflective in order to provide sufficient feedback of the light into the cavity to form the described resonator).

With respect to claims 4 and 5, Zimmermann additionally teaches the adjustment apparatus to have a thermal regulating device for said laser diode, which heats the diode (fig.5 #86, col.8 lines 45-48).

With respect to claim 6, Zimmermann additionally teaches a thermal regulating device for cooling the diode (fig.9 #120).

With respect to claim 8, Zimmermann additionally teaches the measurement apparatus to have a monitor diode disposed adjacent to said highly reflective mirror surface of said optical resonator and detecting light output from said resonator by said mirror surface (fig.5 #91).

With respect to claim 11, Zimmermann additionally teaches said laser diode to form a Fabry-Perot semiconductor laser (col.7 lines 54-56, wherein a Fabry-Perot type

laser is well known to be an industry standard diode laser used in external cavity modules) having a facet formed by said highly reflective mirror surface of said optical resonator (col.2 lines 21-22, wherein it is inherent that the back facet of the laser diode is highly reflective in order to provide sufficient feedback of the light into the cavity to form the described resonator).

While not relied upon in this rejection, Kapany et al. (US 6480513, note col.5 lines 25-30) further speaks of the prominent usage of Fabry-Perot type laser diodes in external cavity modules.

With respect to claim 12, Zimmermann additionally teaches the front facet of the Fabry-Perot laser diode to include an anti-reflection coating (col.7 lines 55-56).

With respect to claims 13 and 14, Zimmermann additionally teaches the Bragg grating to have a central wavelength (col.8 lines 12-14) and that the control apparatus controls the adjustment apparatus to approach, and eventually equal, the central wavelength of said Bragg grating (col.8 lines 61-64).

With respect to claim 17, Zimmermann teaches the laser module outlined in the rejection to claim 1, but does not teach the coupling optics to have a reflection coating. Anthon teaches an external cavity laser utilizing lenses that are antireflection coated (col.4 lines 56-57). It would have been obvious to one of ordinary skill at the time of the invention to combine the laser module of Zimmermann with the antireflection coated lenses of Anthon in order to prevent unwanted interference due to similarly unwanted reflections.

With respect to claim 19, Zimmerman and Nagai teach the use of single mode optical fiber (col.3 lines 11-17). Zimmermann does not teach the fiber to be made of glass. Glass fibers are very well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a fiber made of glass, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

With respect to claim 20, Zimmermann and Nagai teach the use of an optical fiber with an antireflection-coated end (col.2 lines 36-39). Zimmermann does not teach the fiber to be made of glass. Glass fibers are very well known in the art. It would have been obvious to one having ordinary skill in the art at the time the invention was made to use a fiber made of glass, since it has been held to be within the general skill of a worker in the art to select a known material on the basis of its suitability for the intended use as a matter of obvious design choice. *In re Leshin*, 227 F.2d 197, 125 USPQ 416 (CCPA 1960).

With respect to claim 22, Zimmermann additionally teaches the Bragg grating is immediately adjacent said laser diode (fig.5 #94,89).

With respect to claim 25, Zimmermann and Nagai teach a method of stabilizing an output wavelength of a laser module comprising: a) providing the elements as outlined in the rejection to claim 1, b) measuring the photon density within the resonator at a first effective optical path length of the resonator, c) changing the effective optical path length of the resonator, d) measuring the photon density within the resonator at a

second effective optical path length of the resonator, e) comparing the two measured photon densities (col.11 lines 30-33), f) adjusting the optical path length of the resonator based on the comparing step, with the effective optical path length of the resonator being changed depending on the comparing step (col.11 lines 41-45), g) repeating steps b-f until the emitted wavelength is equal to a desired wavelength (col.8 lines 53-64). Zimmerman and Nagai do not teach the process to repeat throughout the life of the laser module. It would have been obvious to one of ordinary skill in the art at the time of the invention to extend the operating period of the feedback loop to function for the duration of the module life in order to insure proper wavelength stabilization throughout all operational usage.

The examiner notes samplings of references supporting the obviousness of wavelength stabilization occurring throughout device lifetime are as follows: 2002/0041611, 6714309, 6681133, 6526079, 6377592, and 6349103. These references are not relied upon in making the rejection, but are provided as evidence to the limitation as being common knowledge to one of ordinary skill in the art (please refer to MPEP 2144.03 C).

With respect to claim 26, Zimmermann and Nagai teach the method as outlined in the rejection to claim 25, but do not teach using the method continuously throughout the life of the device. It would have been obvious to one of ordinary skill in the art at the time of the invention to continue the monitoring and adjustment of the laser module (col.8 lines 61-64) for any desired length of time as is discussed in MPEP 2144.04 V e, In re Dilnot, 319 F.2d 188, 138 USPQ 248 (CCPA 1963).

With respect to claim 27, Zimmermann additionally teaches repeating the steps until the emitted wavelength equals a central wavelength of the Bragg grating (col.8 lines 61-64).

With respect to claim 28, Zimmermann additionally teaches the measuring to utilize a monitor diode (fig.5 #91).

With respect to claim 30, Zimmermann additionally teaches adjusting the optical path length by externally changing the temperature of the diode (col.8 lines 45-47).

With respect to claims 31 and 35, Zimmermann additionally teaches the comparison of the measured photon densities to be carried out by using a calculated slope (col.11 lines 31-45). Zimmermann and Anton do not teach the control command to be based on a difference (subtraction) between two successive measurements, the amount of adjustment of the effective optical length being proportional to the amount of difference between the two successive measurements. It would have been obvious to one of ordinary skill in the art at the time of the invention to use a well known slope formula (Y2-Y1/X2-X1, based on successive measurements, adjustment then being proportional to the difference to the successive measurements; see MPEP 2144 - RATIONALE MAY BE IN A REFERENCE, OR REASONED FROM COMMON KNOWLEDGE IN THE ART, SCIENTIFIC PRINCIPLES, ART-RECOGNIZED EQUIVALENTS, OR LEGAL PRECEDENT – the basic rise over run slope calculation being common knowledge in the art) to simplify the control calculations using basic arithmetic.

With respect to claims 36 and 38, Zimmerman additionally teaches the use of a non-spherical lens (fig.5), as well as a front facet of the laser diode includes a tilt angle with respect to a laser axis (angle=0).

Zimmermann does not disclose the particular lens claimed in claim 37. However these lenses are well known in the art of fiber waveguides. The type of lens does not appear critical to the operation of the device, therefore it would have been obvious to one skilled in the art to substitute the known lens of the graded index type into the system of Zimmerman by an obvious engineering design choice.

Claim 21 is rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann and Nagai in view of Anthon (US 6125222).

With respect to claim 21, Zimmermann and Nagai teach the laser module outlined in the rejection to claim 1, but does not teach the end of the fiber to be slightly inclined. Anthon teaches an external cavity laser wherein the end of an optical fiber is slightly inclined (col.5 lines 5-7). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module of Zimmermann and Nagai with the inclined fiber of Anthon in order avoid any unwanted back reflections (Anthon, col.5 lines 6-7).

Claims 3 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann and Nagai in view of Tomlinson et al. (US 2003/0035449).

With respect to claim 3, Zimmermann and Nagai teach the laser module outlined in the rejection to claim 1 including an adjustment apparatus. Zimmermann does not teach the adjustment apparatus to be a device for longitudinal movement of said optical waveguide. Tomlinson teaches a device for longitudinal movement in an external cavity laser system ([0033], use of piezoelectric stages). It would have been obvious to one of ordinary skill in the art at the time of the invention to combine the laser module of Zimmermann and Nagai with the movement device of Tomlinson to effectively control the detuning of the module (Tomlinson [0033]).

With respect to claim 7, Zimmermann and Nagai teach the laser module outlined in the rejection to claim 1, but does not teach the adjustment apparatus to have a device for varying an operating current of the laser diode. Tomlinson teaches a device for varying an operating current of the laser diode ([0031]). It would have been obvious at the time of the invention to combine the laser module of Zimmermann and Nagai with the current varying device of Tomlinson to provide constant output power to the device (Tomlinson [0031]).

Claims 9, 23, 29, and 32 are rejected under 35 U.S.C. 103(a) as being unpatentable over Zimmermann and Nagai in view of Daiber et al. (US 2003/0012239).

With respect to claim 9, Zimmermann and Nagai teach the laser module outlined in the rejection to claim 1, but do not teach the measurement apparatus to have a detector for detecting a voltage across said laser diode when the operating current is constant. Daiber teaches an external cavity laser which utilizes a voltage monitor across

the gain region ([0006]). It would have been obvious at the time of the invention to combine the laser module of Zimmermann and Nagai with the voltage monitor of Daiber in order to monitor loss elements outside of the gain region (Daiber [0006]).

With respect to claim 23, Zimmermann and Nagai teach the laser module outlined in the rejection to claim 1, but do not teach the control apparatus to emit a control command to said adjustment apparatus to change the effective optical path length of said resonator by a predetermined fixed amount. Daiber teaches an external cavity laser utilizing a controller that uses data stored in a lookup table ([0045], wherein the data in the table is of a predetermined, fixed value). It would have been obvious to one of ordinary skill at the time of the invention to combine the laser module of Zimmermann and Nagai with the control function of Daiber in order to simplify calculations and load on a controlling processor.

Claims 29 and 32 are rejected for the same reasons as claims 1, 9, and 23. These claims merely detail the methods of process flow for the module. The method of process flow for a device is not germane to the patentability of the device itself, therefore these limitations are not given patentable weight. At best these claims could be characterized as product-by-process claims, where the process limitations are not limiting, only the structure implied by the process. See MPEP 2113. Here, the structure implied by the process steps is merely the structure of claims 1, 9, and 10.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tod T. Van Roy whose telephone number is (571)272-8447. The examiner can normally be reached on M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Minsun Harvey can be reached on (571)272-1835. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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